Technological environment, by its very nature, is perpetually in a state of ferment and interest is evidenced in the trends by all concerned. It is frequent to read about yearly or ten-year technological trends.[10] Currently, for instance, we observe keen interest in the issue of digital divide in India. Exhibit 3.11 presents a brief profile of the digital divide in India and how it can be viewed as a great technological opportunity by the Indian organisations to build strategies upon.

Exhibit 3.11   Digital divide: An emerging aspect of the technological environment in India

According to the IT encyclopaedia Whatis.com, the term 'digital divide' describes the fact that the world can be divided into people who do and people who don't have access to—and the capability to use—modern information technology, such as the telephone, television or the Internet.

The boundaries of the digital divide in the world could be many. Besides the traditional dichotomy of the 'haves versus haves-not', there could be a developed versus developing country divide, the rich and poor countries divide, English speaking and non-English speaking people divide, Anglo-Saxon culture and the rest and so on.

Within a country or society, the digital divide could be manifested in terms of gender group, age groups, socio-economic groups and rural versus urban groups. In terms of information technology, it may not be limited to the possession of computers or access to the Internet, but also to the skills to use them.

Digital divide is a controversial current technological issue. If you access the Internet (assuming the readers of this book are not the victims of digital divide!) you will find a wealth of information related to this issue. There are the both good and bad stories of digital divide in India. Let's take the bad stories first.

The negative aspects of the digital divide are mainly seen, for instance, in terms of the dismal statistics related to the telephone density, number of personal computers, access to the Internet in India or even the number of people who know the English language. Take this example: most worldwide web sources are in English. Barely 50 million Indians know English. So what happens to the rest? They may be wealthy, literate, educated or whatever, but since they don't know English, they can't utilise the Internet well.

The good stories relate how individuals, organisations and the Central and State governments are working to bridge the digital divide. These relate to how some State governments are providing public services through the Internet such as Madhya Pradesh government's successful experiment in Dhar district, how Pradeep Lokhande's NGO in Pune helps bring used computers, donated by NRIs abroad, to the villages in rural Maharashtra or how *Melurnet* provides connectivity to the poor people in the Madurai district.

Of significance here is the fact that the digital divide is real, it exists and it can be seen as a technological opportunity by the organisations rather than as a controversial issue to be debated upon endlessly. When EID Parry of Chennai, through its portal (indiagriiline.com) connects the sugarcane farmers it deals with as suppliers or Amul of Anand uses it to manage information in association with its milk producers through village-based information kiosks, it is an example of utilising the digital divide as a technological opportunity that benefits both the company and the community.

Sources: Adapted from Keniston K. & Kumar D., *Four Digital Divides*, Sage Publications, Delhi 2003; Nguessan, M., 'Defining the boundaries of the digital divide', *Proceedings of the Second International Conference on Technology, Knowledge and Society*, 12-15 December 2005, Hyderabad; the website of *Good News India Magazine* at: http://www.goodnewsindia.com/Pages/content/economy/ddivide.html, Retrieved February 2, 2007.

This section of the chapter has been devoted to a discussion of the eight different sectors constituting the external environment of an organisation. By no means is it claimed that our coverage of environmental sectors is all-encompassing. There are other sectors too worthy of consideration. For instance, the natural, physical or geographical environment, to which a passing reference has been made while discussing regulatory environment, is also of great concern to companies. Environmental protection is of paramount importance in a world where the issues of sustainable development have assumed great significance. The

corporate sector is now required to adhere to a plethora of regulations for environmental protection and control of pollution. This is especially relevant for polluting industries like processing plants and refineries.

It should be noted that any classification of the environment into sectors is artificial and is meant solely for gaining an understanding of the different environment factors. In reality, the dividing line between the different sectors of the environment is hazy and there is a high level of interaction between variables belonging to various environmental sectors. For example, market demand, which is a part of the market environment, does not exist in isolation, but is dependent on other factors such as the general state of the economy, buyer motivation or technical quality of the products. Apart from the inter-sectoral interaction, there are complex interlinkages existing among the factors in the same sector of the environment. To consider an example of such an interlinkage, the technological environment has a number of factors and influences. Among these, collaboration in and transfer of technology affect the development of technology in a particular company and also in the industry as a whole. When the technological level is raised, it has repercussions on human beings and the man-machine system. There are implications for the environmental effects of the technology. A perceptive reader would also be able to read between the lines in the illustrations and exhibits provided of the inter-sectoral and intra-sectoral nature of the environmental factors. In this manner, both inter-sectoral and intra-sectoral interactions have to be considered while understanding the different environmental sectors. Strategists have to constantly monitor the environment and its different sectors for opportunities and threats that have, or are likely to have, an impact on their organisations. Such a monitoring is done through environmental scanning.

3.3 ENVIRONMENTAL SCANNING

In the preceding two sections, we have seen how organisations can comprehend the environment in which they exist, identify their environment and classify it into different sectors. In this section, we turn to the methods and techniques employed by the organisations to monitor their environment and to gather data to derive information about the opportunities and threats that affect their business. *Environmental scanning can be defined as the process by which organisations monitor their relevant environment to identify opportunities and threats affecting their business for the purpose of taking strategic decisions.*

Factors to be Considered for Environmental Scanning

The external environment in which an organisation exists consists of a bewildering variety of factors. These factors (could also be termed as influences) are events, trends, issues and expectations of different interested groups. These factors are explained below:

- *Events* are important and specific occurrences taking place in different environmental sectors.
- *Trends* are the general tendencies or the courses of action along which events take place.
- *Issues* are the current concerns that arise in response to events and trends.
- *Expectations* are the demands made by interested groups in the light of their concern for issues.

Take the example of the first public issue of shares of Reliance Industries in 1977. That was a specific event. The trend that started was of wider participation of public in equity investment in private sector companies. Note that earlier to that event, equity participation in India was limited to an exclusive class of investors and the general public was not aware or interested in investing money in shares. The issue that emerged was of the development of equity culture in India. The expectation by the general public that resulted was that the fruits of the economic development in the corporate sector would be shared by all and sundry. An allied expectation that ensued was of protection of small or minority shareholders from rapacious private business persons through legislation and governmental action.

Another example is of the gas leakage accident that took place way back in December 1984, at the Union Carbide factory at Bhopal. That accident and the resulting disaster was an event. The trend that has arisen as

a result is a general tendency on the part of the regulatory authorities and organisations to be conscious about safety from hazardous exposure to chemicals. The issue is of a rising concern about environmental pollution. The expectation of the general public from the government is of legislating changes in rules and regulations pertaining to safety measures and stricter enforcement through various mechanisms.

Environmental influences are a complex amalgam of the events, trends, issues and expectations that continually shape the business environment of an organisation. There is some research evidence to suggest that Indian organisations conduct environmental scanning for strategic planning. Probably, the earliest study reported is by Wadhva, 1974. His working paper attempted to provide a framework for scanning the external environment of a large industrial enterprise in the private sector in India. The purpose was to help the company in the long term planning of its activities. The impact of international, technological, national, economic, social, demographic, political and governmental regulatory conditions impinging upon the existing activities of the company was analysed. Particular attention was paid to the impact of the national five-year plans on company operations.[11] In an earlier section, we have referred to three other studies in the Indian context: Dixit (1987), Subramaniam (1989) and Shah (1996).[12]

By monitoring the environment through environmental scanning, an organisation can consider the impact of the different events, trends, issues and expectations on its strategic management process. Since the environment facing any organisation is complex and scanning it is absolutely essential, strategists have to deal cautiously with the process of environmental scanning. It has to be done in a manner that unnecessary time and effort is not expended, while important factors are not ignored. For this to take place, it is important to devise an approach, or a combination of different approaches, to environmental scanning.

Approaches to Environmental Scanning

Kubr has suggested three approaches which could be adopted for sorting out information for environmental scanning.[13] We could call these approaches as systematic, *ad hoc* and processed-form approaches.

1. Systematic Approach Under this approach, information for environmental scanning is collected systematically. Information related to markets and customers, changes in legislation and regulations that have a direct impact on an organisation's activities, government policy statements pertaining to the organisation's business and industry, etc. could be collected continuously to monitor changes and take the relevant factors into account. Continuously updating such information is necessary not only for strategic management but also for operational activities.

2. Ad hoc Approach Using this approach, an organisation may conduct special surveys and studies to deal with specific environmental issues from time to time. Such studies may be conducted, for instance, when an organisation has to undertake special projects, evaluate existing strategies or devise new strategies. Changes and unforeseen developments may also be investigated with regard to their impact on the organisation.

3. Processed-form Approach For adopting this approach, the organisation uses information in a processed form, available from different sources both inside and outside the organisation. When an organisation uses information supplied by government agencies or private institutions, it uses secondary sources of data and the information is available in a processed form.

Since environmental scanning is absolutely necessary for strategy formulation, organisations use different practical combinations or approaches to monitor their relevant environments. These approaches may range from an informal assessment of the environmental factors to a highly systematic and formal procedure. Informal assessment may be adopted as a reactive measure to a crisis and *ad hoc* studies may be undertaken occasionally. A highly systematic and formal procedure may be used as a proactive measure in anticipation

of changes in environmental factors and structured data collection and processing system may be used continuously.[14]

Between the two extremes of the informal and formal approaches, different stances adopted by organisations might exist, depending on varying degrees of concern for the environment. Such stances are situational. For example, when an issue-related decision has to be taken, a periodic monitoring of the environment may be done. Systematic and *ad hoc* approaches can be used for the relevant environment of the organisation while the processed-form approach could be used to appraise both the relevant as well as the general environment. Whatever approach is adopted for environmental scanning, data collection is necessary for deriving information about environmental factors.

Sources of Information for Environmental Scanning

The various sources of information tapped for collecting data for environmental scanning could be classified in different ways. There could be formal and informal sources. Then there could be written as well as verbal sources. In terms of origin, data sources could be external and internal.

Given below are some of the important types of sources of information.

1. *Documentary or secondary sources* of information like different types of publications. These could be newspapers, magazines, journals, books, trade and industry association newsletters, government publications, annual reports of competitor companies, commercial databases, etc.
2. *Mass media* such as radio, television and Internet.
3. *Internal sources* like company files and documents, internal reports and memoranda, management information system, databases, company employees, sales staff, etc.
4. *External agencies* like customers, marketing intermediaries, suppliers, trade associations, government agencies, etc.
5. *Formal studies* done by employees, market research agencies, consultants and educational institutions.
6. *Spying and surveillance* through ex-employees of competitors, industrial espionage agencies, or by planting 'moles' in rival companies. The ethicality of these sources is doubtful but nevertheless, these are used and so need a mention.

Strategists use different information sources depending on their needs for environmental scanning. Government publications—though a rich and comprehensive source of information—usually are available after a considerable time lag. Private sources, though relevant and timely, are quite expensive to tap. Therefore, whenever a particular information source is used, it should be checked for its reliability, time frame, methods of data collection and analysis used, form of presentation, etc. Exhibit 3.12 provides some important information sources that could be used by strategists in the India context.

Exhibit 3.12 Sources of information for environmental scanning in India

A few selected and important sources which can be used in the Indian context, for collecting information for environmental scanning are suggested below.

1. International publications
    (a) Intergovernmental and international agencies like the UN, UNCTAD, UNDP, UNESCO, UNIDO, ILO, WHO, WTO, FAO, IBRD (World Bank), IMF, OECD, ESCAP and others are a rich source of international statistical data. The *World Development Report, World Economic Survey, Statistical Yearbook* of UN, *International Trade Statistics Yearbook* of UN, etc. are some examples of the major international publications.
    (b) International private data agencies such as country rating agencies like Bloomberg, Fitch, Moody's, Standard & Poor, etc. provide credit rating and ranking of countries with regard to their attractiveness for foreign investments.

2. World Wide Web, On-line databases and systems

   (a) Search Engines such as Alta Vista, Lycos, Google, Yahoo!, etc. are good starting points to search for information related to environmental scanning.

   (b) With the emergence of the Internet, the availability of data has increased manifold. Internet is a convenient access to online data bases of several types of organisations. Government agencies, private data agencies, federations of trade and industry and individual companies and other types of institutions maintain websites that provide access to information. Examples of some major information sources on Internet are: the national portal of India at http://www.india.gov.in/business.php, directory of official websites of the Government of India at http://www.goidirectory.nic.in/, India Image - meant to be a gateway to the and governmental information on the web at http://www.Indiaimage.nic.In/ and government policies are available at http://policies.gov.in/.

   (c) Business people are increasingly turning to the computer to assist them in tracking and managing the voluminous information about their companies and their competitors, as well as general trends in the industry and the economy. Data bases are a rich source of statistical and other types of data regarding the economy, industry and the corporate sector. Several on-line data bases are available worldwide, covering a vast range of subjects.

3. Government publications

   (a) Governmental information sources such as the Census of India reports, five-year plan reports, statistical abstracts of the Indian Union, etc. provide valuable macro-level data useful for planning purpose. Statistical abstracts and statistical handbooks are published by several central and state government agencies. The main drawbacks are the delay in availability of the data and the fact that the data available has to be adapted for its particular use.

   (b) Periodic reports like economic surveys, annual surveys of industries, annual reports of ministries, etc. which provide current data and reflect governmental thinking and priorities.

   (c) Occasional reports brought out by various statutory agencies such as guidelines to industries, policies related to specific industry, export-import policies, etc. which are relevant for business and industry. Reserve Bank of India's Department of Statistics also publishes valuable occasional papers related to different aspects of the economy and industry.

   (d) Reference books and encyclopaedias

4. Institutional publications

   (a) The Centre for Monitoring India Economy (CMIE), which is a private institution, provides publications which contain comprehensive and timely information on economic indices.

   (b) Publications of market research agencies such as the National Council for Applied Economic Research (NCAER), a statutory agency, provide extensive contemporary data on the demographic profile of customers that can be used for strategic and marketing planning. There are several private agencies, several of them in the area of marketing research, that provide similar information.

   (c) Publications of trade and industry federations such as the Confederation of Indian Industry (CII), Federation of Indian Chambers of Commerce & Industry (FICCI), Association of Chambers of Commerce & Industry (ASSOCHAM) and industry associations like National Association of Software and Services Companies (NASSCOM) or Automotive Tyre Manufacturers Association (ATMA).

   (d) Annual company reports, which contain data related to the balance sheet and profit and loss account, apart from information or plans and programmes, are an important source for studies of industry and for competitor analysis. Company in-house journals are also a source of rich information though their circulation is limited among the members of the company.

5. Periodicals and newspapers

   Magazines (*Business Today, Business World, Business Today, Industrial Economist* etc.); and newspapers (*The Economic Times, The Financial Express, Business Standard, Business Line*, etc.) are the most timely

source of information related to a wide variety of issues. Besides the print versions that remain popular, the online editions are emerging as significant sources of information. Local and vernacular press increasingly devotes more space to economic and industrial issues and is a potent source of information related to grassroots issues generally ignored by mainstream media.

6. Industrial espionage agencies.

Private agencies provide information and reports on competitor plans and activities, which may be essential for strategic planning. These are used when information may not be available from other sources.

Methods and Techniques Used for Environmental Scanning

The range of methods and techniques available for environmental scanning is wide. There are formal and systematic techniques as well as intuitive methods available. Strategists may choose from among these methods and techniques, those which suit their needs in terms of the quantity, quality, availability, timeliness, relevance and cost of environmental information.

Various authors have mentioned the methods and techniques used for environmental scanning. LeBell and Krasner outline nine groups of techniques: single-variable extrapolation, theoretical limit envelopes, dynamic modes, mapping, multivariable interaction analysis, unstructured expert opinion, structured expert opinion, structured inexpert opinion and unstructured inexpert speculation.[15]

Fahey, King and Narayanan have included ten techniques in their survey of environmental scanning and forecasting in strategic planning. These are: scenario-writing, simulation, morphological analysis, PPBS, game theory, cross-impact analysis, field anomaly-relation, multiechelon coordination and other forecasting techniques.[16] Of particular interest is the emerging set of techniques based on the complexity theory that is a group of mathematical techniques designed to deal with the dynamic nature of real-world problems. Among the techniques are the applications of the mathematical concepts of fractals, fuzzy logic, genetic algorithms, swarm stimulation, Monte Carlo method and the more popular of them, the chaos theory. Exhibit 3.2 attempts an understanding of the chaos theory and its relevance to strategic management.

Owing to the increasing complexity of the external environment, inevitably there have been attempts to utilise the emerging information technologies in assisting strategic planners in environmental scanning. Techniques based on artificial intelligence, neural networks, data mining and a knowledge-based system have been proposed. An example is that of a software agent-based system for continuous environmental surveillance.[17] Another is Futurus, a business solutions-software by Satyam Computer Services, for designing and simulating future scenarios.[18]

While many of the environmental techniques are based on statistical methods and increasingly, the use of sophisticated software in computer-assisted environmental scanning and forecasting, some of them, like scenario-writing, may not use statistical information but employ informed judgement and intuition to predict what the future is most likely to be, expressed in the form of a descriptive statement or report. Exhibit 3.13 presents information on the popular technique of scenario writing for environmental scanning.

Exhibit 3.13 Scenario writing for environmental scanning

Foresight and futurology require looking into the future by intelligent discerning of influences in the present environment and projecting them into the future. We are interested in foresight and future so as to know what to expect and not to be overtaken by nasty surprises. Knowing what to expect prepares us better to face the future. This is the simple principle behind scenario writing – one of the techniques, others being extrapolation and Delphi surveys for developing foresight and peeping into the future. As Schwartz says in *The Art of the Long View*, scenarios are not about predicting the future; rather they are about perceiving the future in the present.

The uncertainties in today's world arise from myriad influences such as fast-changing technologies, geopolitical developments, new business processes or novel management techniques and strategists anticipate them in order to cope with them effectively. One way to do that is through scenarios. Used for different purposes such as technological forecasting, scenarios are stories that paint a vivid picture of a future state in a narrative format.

Scenarios are used in environmental scanning for strategic planning. Essentially, small groups of experts and stakeholders focus intensely on influences in a particular sector of the environment, say technological or markets, likely to take place during the coming years. They contemplate possible, even improbable, events that could occur to change the pattern of influences and create scenarios that reflect the optimistic, pessimistic and most likely future shape of events to come. These scenarios provide a basis for strategy formulation.

The different stages of scenario writing proposed by Greg Tegart of the APEC Centre for Technology Foresight, Bangkok are:

1. Identifying the focal issue, objectives of the exercise, timeframe and appropriate participants.
2. Environmental analysis for issues and trends in the current environment.
3. Identifying and characterising the key predictable variables such as demography, resources, etc.
4. Identifying critical uncertainties representing possible discontinuities.
5. Clustering of variables into a manageable set.
6. Ranking of variables to establish key driving forces according to their relative importance and rank the critical uncertainties.
7. Selecting of scenario logics that assist in determining the number and characteristics of scenarios to be developed.
8. Developing of scenarios using the key driving forces and developing strings of causally linked likely events into a coherent narrative.
9. Assessing of scenario coherence by critical examination of its logic and coverage.
10. Assessing of implications of scenarios for strategic planning.

Scenario writing helped Singapore formulate its IT vision of an intelligent island. The city of Curitba in Brazil, used it to improve its civic services. New Zealand used it to project itself from an agricultural and industrial economy to a knowledge era economy. The US Federal Railroad Administration uses it for its strategic planning. India Vision 2020 used it extensively for technological scenario in the IT services sector. Royal Dutch Shell uses it to develop foresight on a wide range of issues related to energy, economics and politics in the various countries it operates. Several companies in Indian industries, including biotechnology (Panacea Biotec), consultancy (e.g. Satyam Computer Services), energy (e.g. Cairn India), fertiliser (e.g. SPIC), IT services (e.g. Gartner) and pharmaceuticals (e.g. EMD Pharma) report using scenario writing for various purposes including strategic planning.

Sources: Based on B.S. Flowers, "The art and strategy of scenario writing", *Strategy & Leadership*, 2003, 31:2, pp. 29-33; R.E. Neilson & D. Stouffer, "Narrating the Vision Scenarios in Action", *The Futurist*, May/Jun 2005, Vol.39, Issue 3, pp. 26-31; G. Tegart, "Technology Foresight: Philosophy & Principles", available at *http://www.apecforesight.org/apec_wide/docs/ForesightMethod.doc*, Retrieved February 5, 2007.

Process based techniques for environmental scanning have been proposed from time to time. For instance, a four-step technique called QUEST (Quick environmental scanning technique), proposed by B. Nanus uses scenario writing by a team of strategists.[19] Day and Schoemaker have proposed a seven-step process for developing peripheral vision that vigilant organisations should develop, based on the assumption that opportunities and threats often begin as weak signals from the periphery of the external environment.[20]

Strategists have to be aware of the pitfalls of the environmental scanning process so as to use it judiciously.

Pitfalls in-Environmental Scanning

Just like any other strategic planning technique, environmental scanning has its soft underbelly. We could enumerate at least five pitfalls faced while using environmental scanning:

- Sometimes, strategic planners may focus excessively on the influences in the relevant environment that they miss out on the trends and issues in the general environment that really matter.
- There is a danger of 'paralysis by analysis', meaning that environmental scanning can create such an overload of information that it may prevent timely action. Environmental scanning should not become a number-crunching or paper-pushing routine.
- The purpose of environmental scanning is to uncover influences that matter for the future of the organisational strategic decision-making. This purpose should not be lost and environmental scanning should not be used for purposes other than this. For instance, scanning results cannot be used for political manoeuvring by strategists to favour their own viewpoint, functional interests or departmental aims.
- The environmental scanning function should not be integrated too closely with the operational and functional activities of the organisation. This means that it should not become a line function, thus aligning it too closely with the interests of those activities.
- Similarly, environmental scanning should not be too far from the realities of the organisation, making it an impersonal, staff function.

After the environmental scanning process is complete, the strategists are faced with the question of how to structure the mass of information available to them. The problem boils down to sifting the information in such a manner that a clear picture emerges of what opportunities and threats operating in different sectors of the environment face the organisation.

3.4 APPRAISING THE ENVIRONMENT

In order to draw a clear picture of what opportunities and threats are faced by the organisation at a given time, it is necessary to appraise the environment. This is done by being aware of the factors that affect environmental appraisal, identifying the environmental factors and structuring the results of this environmental appraisal.

Factors Affecting Environmental Appraisal

Given the same environmental conditions, no two strategists or two organisations would appraise the environment in a similar fashion. This is due to the many factors that affect the process of environmental appraisal. We could identify these factors by classifying them into three categories: the strategist-related, organisation-related and environment-related factors.

1. Strategist-related Factors   There are many factors related to the strategist, which affect the process of environmental appraisal. Since strategists play a central role in the formulation of strategies, their characteristics such as age, education, experience, motivation level, cognitive styles, ability to withstand time pressures and strain of responsibility have an impact on the extent to which they are able to appraise their organisation's environment and how well they are able to do it. Apart from these factors that are related to strategists as individuals, group characteristics could be the interpersonal relations between the different strategists involved in appraisal, team spirit and the power equations operating between them. Information consciousness is yet another variable denoting the attitude of top managers towards environmental scanning and the communication patterns established among managers within the organisation.[21]

2. Organisation-related Factors   Like those of strategists, many characteristics of the organisation also have an impact on the environmental appraisal process. These characteristics are the nature of business the organisation is in, its age, size and complexity, the nature of its markets and the product or services that it provides. Another variable identified is of information climate, which as assessed through the information infrastructure implemented, i.e. the processes, technologies and people used in information acquisition and handling.[22]